# THE SKULL OF AN AUSTRALIAN ABORIGINAL FOUND AT STRADBROKE ISLAND, QUEENSLAND.

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(Text-figures 1 to 7 and Plates XV—XVIII.)

The skull, No. Q.E. 14/561, has been known as the Wynnum skull because the records show that it was brought to the Museum from Wynnum, a suburb of Brisbane. A search through official correspondence has, however, brought to light a letter which reveals that it was found on the beach at Jumpinpin on the east side of Stradbroke Island on the 28th May, 1914. Further information is contained in the letter that 20 years previously there were five graves in the vicinity of where the skull was found, but the sea broke over this part some years ago and washed the graves away, and made the channel at Jumpinpin, dividing Stradbroke Island.

A brief description of the skull was given by Longman (1918) in which he referred to its relatively large proportions for an Australian aboriginal. The skull is, however, definitely that of an Australian aboriginal and no further description would be warranted were it not for the fact that it has undergone a certain degree of mineralisation.

The discoveries of the Talgai skull and, later, of the Cohuna skull—both of which are clearly Australian—vaguely suggest from their state of mineralisation, and from what we know of their sites of discovery, that the aboriginal was an inhabitant of the continent for a long period of time. The geological age of the Talgai skull is somewhat uncertain ; but the considered opinion of S. A. Smith (1918), derived from the observations of Edgeworth David, is that "the claim to high geological antiquity—the assignation of the fossil to the Pleistocene—is very strongly supported, and may be regarded as established." The geological evidence for the age of the Cohuna skull has not been published but it would appear to be of later date than the Talgai skull.

Further evidence of the antiquity of man in Australia is provided by the excavations of Hale and Tindale (1930) in the Lower Murray Valley. These authors, by employing accurate methods of excavation, have established definite cultural layers in which human remains were found ; and have given to us for the first time a foundation on which to build up cultural sequences and to determine relative age groupings.

It is desirable, in the light of these findings, to place on record the morphological features of any human material which shows evidence of mineralisation in order that such information may be used for the purposes of confirmation and comparison with material which may be found subsequently.

*Method.*—The description of the skull is dealt with, firstly, by making an accurate survey of the various normae using the Frankfort plane as the base (figs. 1 to 6); secondly, by constructing a centimetre-contoured map on the Frankfort plane in order to give expression to the various slopes of the skull (fig. 7); and, thirdly, by the use of photographs to illustrate the non-metrical features (pl. xv, figs. 8 to 11, and pl. xvi, figs. 12 to 14). The photographs were taken by Mr. L. Schaeffer, of the Department of Anatomy, and to him I express my thanks. A brief description of the endocranial cast is also given.

By the use of the above methods the written description can be considerably curtailed. Detailed measurements of the skull are not given because those who find scientific satisfaction in their use can read off any desired measurements from the surveys. Three measurements are, however, of interest because they are unusual in the skull of the Australian aboriginal. The maximum length is 202 mms., the maximum breadth 140 mms., and the minimum frontal width 105 mms. The length is the same as that found by Duckworth (1894) in No. 2101 of his series; it is 2 mms. less than the skull recorded by Miklucho-Maclay (1883), and is only 2 mms. more than many of the skulls recorded by Turner (1884) and Klaatsch (1908). The maximum breadth and minimum frontal breadth are also above the average for the Australian. The skull is also unusually thick.

*The Cranium. Norma verticalis* (figs. 1, 7, and 8).—The skull, seen from above, has the form of a long ovoid, with the widest part of the skull situated 20 mms. posterior to the level of the external auditory meatus. Anteriorly the general outline is more sharply curved than it is posteriorly. The parietal eminence is not well marked on account of the general flatness of the lateral walls of the cranium. The slopes of the frontal region are uniform; and the frontal eminences have become smoothed out in the general outline. A typical Australian form is thus present in conjunction with a greater average size, which, however, is due is some measure to the excessive thickness of the skull.

Anteriorly the arci superciliares form two rounded projections extending from the midline to a point just lateral to the groove for the supraorbital vessels and nerve. Medially a well marked fossa supraglabellaris is present, whilst laterally the arci are smoothed off into the supraorbital trigones (fig. 3 *d*). Remaining traces of the coronal and sagittal sutures permit the identification of bregma.

*Norma occipitalis* (figs. 2 and pl. xv, fig. 9).—Viewed from behind the general contour presents a typical Australian facies. Laterally the side walls are flat and slope outwards very slightly as they extend from the mastoid processes to the parietal eminences. The superior surface, extending from the parietal eminence to the middle line, is flat to slightly concave. There is a slightly raised and rounded keel in the middle line. The whole appearance is very similar to that of the Australian depicted by Martin in fig. 370 (1928).

The most salient feature of the posterior region is the well developed *torus occipitalis transversus*. The torus is 20 mms. wide and extends laterally on either side for a distance of 25 mms. as a prominent and uniform ridge. There is no external occipital protruberance, although there is a small roughened ridge passing downwards on the nuchal surface from its midpoint. The torus is not symmetrical. On the left side it forms a fuller curve than on the right side ; and therefore extends higher into the supraoccipital bone. At a distance of 20 mms. from the middle line the torus resolves itself into two ridges, an upper and a lower. The upper ridge represents the *linea nuchae suprema* and the lower ridge the *linea nuchae superior*. The condition is very similar to that described by Burkitt and Hunter (1922) in skull 792 of the Sydney University series ; but the torus is more pronounced in the Stradbroke skull. The upper ridge fades away anteriorly in a large flat triangular area situated behind the superior temporal ridge on the postero-inferior angle of the parietal bone. The lower ridge retains its prominence and passes uninterruptedly into the mastoidal crest. The region between the torus occipitalis and lambda is raised into a planum occipitale, which is a common feature of the Australian skull.

The sutures in the region of asterion are still open ; but midway between asterion and lambda the upper part of the lambdoidal suture becomes obliterated. The condition of the closure of the sutures indicates that the age of the individual was between 60 and 70, basing the estimation on the work of Wingate Todd and Lyon (1925).

On the inner surface of the occipital region the groove for the transverse sinus is placed at a lower level than the torus occipitalis (fig. 5)—a condition commonly found in the skull of the Australian—Klaatsch (1908), Burkitt and Hunter (1922).

*Norma frontalis* (fig. 3 and pl. xv, fig. 10).—The whole of the facial skeleton is missing. Seen from the front the most salient features are the form of the supra-orbital region and the width of the anterior frontal region. The minimum frontal diameter measures 105 mms., which is unusually great for the Australian.

The supraorbital region shows a moderate degree of prominence in well developed superciliary eminences. It conforms to type 11 of Cunningham (1908) in

which the superciliary ridge coalesces with the part of the supraorbital ridge which lies medial to the supraorbital notch. On the outer side of the notch the *superciliary eminence* or ridge (*b*) extends outwards and fades into the flattened *supraorbital trigone* (*d*). On the inner side the superciliary eminence turns sharply under the glabellar region so that there must have been in this skull a very depressed root of the nose. Unfortunately there is no trace of either a fronto-nasal or fronto-maxillary suture. The glabellar region (*g*) is slightly depressed and extends upwards into a well marked *fossa supraglabellaris* (*s*).

The supraorbital region in this skull is almost identical with that of skull 340 of the University of Sydney series. There is, however, a significant difference between the Stradbroke skull and those which have been sectioned in the University of Sydney. Cunningham (1908), in discussing the relation of the superciliary eminence to the frontal air sinuses, referred to the fact that the extent of the air sinuses appeared to have no relation with the size of the superciliary eminence ; and, further, referred to the observation of Schwalbe (1901), that in the Neanderthal cranium the air sinuses lie well back and that a thick layer of condensed bone forms their anterior wall. Burkitt and Hunter (1922) found the maximum thickness of this condensed outer table to be 7·5 mms. at the glabella in skull 792.

In the Stradbroke skull the air sinuses are well developed (figs. 6 and 14) ; they are practically coincident in their extent with the superciliary eminences and extend also to the roof of the orbit ; but they differ from the other skulls in the Sydney collection in that the condensed outer table only measures 2 mms. as contrasted with 7·5 mms. in skull 792.

*Norma lateralis* (fig. 4 and pl. xv, fig. 11, pl. xvi, fig. 13).—The prominences produced by the torus occipitalis and arcus superciliaris are well shown when seen from the side. The torus occipitalis is clearly defined by the depressed nuchal area below and by the fossa supra-toralis above. The fossa supra-toralis is somewhat accentuated by the flattened surface of the supraoccipital region as high as lambda.

Although the mastoid processes are damaged on both sides it can be seen that they are of small size. On the left side, where only the tip of the process is lost, the mastoid process appears to confirm the opinion of Klaatsch (1908) that it is only the enlargement of the crista mastoidea (fig. 13). The crista mastoidea is continuous with the superior nuchal line and is here represented by a well marked ridge. The supramastoid crest—the continuation of the upper border of the zygomatic process —is separated from the mastoid crest by an interval of 30 mms. In many of the Australian skulls this interval is occupied by a furrow which passes to the postero-inferior angle of the parietal bone. In the Stradbroke skull there is no furrow on the

petrous part of the temporal bone ; but there is a definite depression where the anterior part of the postero-inferior angle of the parietal bone fits into the petro-squamosal angle. The region of the mastoid process conforms to the Australian type.

The inferior temporal crest passes continuously from the external angular process to the suprameatal crest. It is well defined throughout with only slight deformation where it passes the coronal suture. The temporal region bounded by this line is relatively flat. Anteriorly it is somewhat fuller than in the majority of Australian skulls, in harmony with the fact that its minimum frontal width is 105 mms.

The area of the skull above the temporal crest forms a continuous surface extending from the arcus superciliaris anteriorly to the torus occipitalis posteriorly. It is divisible into frontal, parietal and occipital sections. The frontal portion is somewhat full and rounded as far as the coronal suture ; so that the general form is smoothed off and there is no frontal eminence. In No. 752 and many other Australian skulls the frontal region immediately anterior to the coronal suture is depressed and flattened ; and in the majority of the Australian endocranial casts which I have examined there is a corresponding precentral depression of the frontal lobe. The precentral depression is a marked feature in the endocranial cast of the Wynnum skull. The full and rounded frontal region externally associated with a depressed frontal lobe internally is one of the most interesting morphological features of the skull. In the midline section of the skull (fig. 6) the bone is unusually thick ; at the torus occipitalis it measures 15 mms. ; above this it thins for a short distance to 7 mms., increasing again in the region of lambda—where the sutures are completely closed—to 14 mms. ; anterior to this the cranium in the mid-parietal region thins to 9 mms. to widen out again at bregma to 12 mms. ; and in front of this the thickness in the frontal region increases to 13 mms. The area of the frontal bone in which this thickness occurs extends laterally to include the whole of the frontal vault medial to the temporal crest. This thickening produces a flattened area of the inner table of the frontal bone which causes the precentral depression of the endocranial cast. The thickness of the skull exceeds that of any Australian skull which I have seen, and is slightly greater than that of the Piltdown fragments as determined from the casts.

Figure 15 shows the X-ray picture of the left side of the skull, for which I am indebted to my brother Dr. K. E. Shellshear. It shows two interesting stages in the age changes of the human skull. Harris (1933) has shown that after fifty the venous sinuses in the diploe gradually disappear, that new bone

is deposited in the diploe, and that the radiographic appearances change. Further, he refers to the laying down of dense new bone deposited between the dura and the inner table in old men at the site where there is atrophy of the frontal lobes. Now, in the radiographic picture of this skull the pattern of the diploic veins is well shown over the parietal area and over the lower part of the frontal area ; but at the borders of the thickened inner table of the frontal bone the diploic veins are disappearing and there are none over the thickness area itself. In dealing with the endocranial cast this question will be further discussed.

The parietal portion of the superior surface shows a depressed surface immediately posterior to the coronal elevation. This depression on the surface corresponds to the post-central area of ill-filling shown on the endocranial cast ; on this, however, it is more marked because the bone is somewhat thinner over the parietal eminence.

*Norma basilaris* (fig. 5 and pl. xvi, fig. 12).—The greater part of the base of the skull is missing. It is sufficiently described in the figures referred to above.

*The endocranial cast* (pl. xviii, figs. 16 to 19).—In the study of this cast I have the advantage of having for comparison a series of 25 casts of Australian skulls, as well as a large series of Chinese and most of the prehistoric casts of fossil skulls. The importance of the study of the endocranial cast is emphasised in the work of Elliot Smith ; and furthermore he has simplified the task of their examination by clearly setting out the principles involved. He writes (1926 ): " In approaching the study of the cast of the cranial cavity and attempting from it to interpret the nature of the brain that originally occupied a particular skull, our aims to-day are of a different nature than those of our predecessors. It is not so much the attempt to identify certain definite fissures and convolutions of the brain, as to determine the relative state of development of different functional areas of the brain. . . . . Hence the chief object is to base our conclusions not so much upon the size of any particular brain, as upon the relative size of those particular regions which are of significance in phylogenetics."

The distinctive features which distinguish the endocranial cast of *Homo sapiens* from those of lower types of human species are so clearly seen in this cast that no discussion is necessary on that aspect of the interpretation ; and so we may confine our attention to those features which distinguish the cast as Australian.

In prosecuting the task of determining the difference in the brain of race, I have collected the endocranial casts of 35 Chinese skulls, 25 Australian aboriginal skulls, and individual casts of other races. A study of this material makes it clear

that the features of the casts indicating racial difference enable one to distinguish racial difference with even more facility than the skulls themselves can be distinguished. The Chinese cast stands out with its large rounded frontal lobes bearing a foreshortened appearance, with its salient parietal eminences, its flattened and foreshortened occipital region, and finally with its cerebellum extending nearly as far posteriorly as the occipital pole of the cerebrum. Whereas, the Australian cast is recognised, amongst other things, by its narrowness accentuating its height, by its narrow and ill developed frontal lobes, and by the small amount of overhang of the cerebellum by the tentorial surface of the cerebrum.

The general form of the Stradbroke cast conforms to the Australian type. It is dolichocephalic, but the type of dolichocephaly differs from the European type in that the occipital region looks diminutive. Looked at from above the edges of the cerebellum project beyond the contour of the parieto-occipital region of the cerebrum laterally. The angle formed by the anterior border of the cerebellum with the inferior border of the temporal lobe is almost 75 degrees and indicates lack of development of the post-temporal (T) and parieto-occipital regions (PO). Immediately anterior to the parietal eminence there is a well marked post-coronal depression (PCD) corresponding with the postcentral and supramarginal regions of the brain. The post-coronal depression is a salient feature in the Australian casts, whereas in the Chinese casts the post-coronal region is almost without exception full and rounded. This post-coronal depression is well seen in the endocranial casts of *Homo rhodesiensis* and *Homo soloensis* and is associated with lack of development of the parietal areas of the brain. But, in attributing the depression to lack of development, the work of Keith (1931) on the effect of the streams and pools of cerebro-spinal fluid on the form of the cast must not be overlooked. Whatever the cause the presence of a post-coronal depression is common in the endocranial cast of the Australian. Immediately anterior to the post-coronal depression there is a fairly prominent coronal elevation (C) which widens out superiorly to blend with a wide sagittal elevation. In the majority of European and Chinese casts the transverse contour of the parietal region displays and even dome-shaped curve. Any irregularity in the curve above is limited to the size of the arachnoid granulations. In the endocranial cast of the aboriginal, however, the general transverse outline is more rugged. Passing along the vertex antero-posteriorly—and even extending forward into the frontal region—is a wide raised plateau lifted up from the general contour. The post-coronal depression ceases at its outer border superiorly and becomes continuous with a depression (P) in the parietal region which lies on the outer side of the plateau as far posteriorly as the parieto-occipital region. On the midline plateau there may be secondary

localised elevations corresponding to those seen in the European and Chinese casts produced by the arachnoid granulations.

The Stradbroke cast clearly demonstrates the features described above. The European and Chinese casts indicate the development of a higher type of brain in the filling up of the sagittal parietal depressions (P), bringing, as it were, the general outline to the level of the midline sagittal elevation.

The frontal lobe, looked at from above and anteriorly, shows a depressed area (F) lying in the angle formed by the coronal and mid-sagittal elevations. This depression of the frontal lobe is seen in most of the Australian casts and is very similar in appearance with the frontal depression seen in the cast of *Homo rhodesiensis*. In the Stradbroke cast, however, the depression is somewhat unusual in that markings for the sulci and gyri of the frontal lobe are not present over the depressed area. In most casts of primitive and modern races, whether a depression is present or not, the gyri and sulci of the frontal lobe leave some impression on the frontal lobe.

Harris (1933) has pointed out that " certain changes in the skull bones during old age seem to be determined by concomitant changes in the underlying brain," and that dense new bone is laid down between the inner table and the dura mater where senile atrophy of the frontal lobe has taken place.

The absence of cerebral markings on the frontal depression, the great thickness of the frontal bone, particularly in this area, and the advanced age of the skull all indicate that, whether a depression was present before the age changes took place or not, the frontal depression in the Stradbroke cast cannot be used as evidence for lack of expansion. Other evidence for lack of expansion is, however, present in the lack of fulness of the orbital margin (O) in the region of the inferior frontal gyrus and in the relatively well marked frontal keel.

The occipital region, looked at from behind (fig. 18), presents an appearance which is significant in determining its Australian status. The occipital poles are almost blended together in one large and rounded swelling standing out from the rest of the cerebrum. At no place does the contour of the parietal lobe run smoothly into that of the occipital lobe. The occipital lobe is everywhere separated by a salient parieto-occipital groove which passes from tentorial border to tentorial border. The prominence of the supra-occipital region—a feature of many Australian skulls—thus leaves its impression on the form of the endocranial cast. The projection of the supra-occipital region is not due to bony thickening but to the occipital projection of the brain ; and actually the midline section of the skull shows the skull to be thinnest in this region.

Above the occipital projection the surface slopes upwards to the midline sagittal plateau (fig. 18) bounded on either side by the parietal depression.

Below the occipital projection the cerebellum is unduly prominent and spreads laterally beyond the level of the parieto-occipital region. Thus undue prominence of the cerebellum, placed relatively far back, is an almost constant feature in the endocranial cast of the Chinese ; and is also seen in the cast of the Bushman D. 709 of the Museum of the Royal College of Surgeons. The cerebellum of the European cast, on the other hand, is, as it were, partly buried under the tentorial surfaces. The occipital region has the appearance of having spread out posteriorly and laterally and thus overflowing the boundaries of the cerebellum.

The relations of the cerebellum to the cerebrum cannot be attributed in the Australian to any retention of primitive features, because in *Sinanthropus*, *Pithecanthropus*, *H. rhodesiensis*, *H. neanderthalensis* and *H. soloensis* the position of the cerebellum accords with the European type. Furthermore, the condition in the Chinese is associated with a fairly high degree of brachycephaly and is also present in the only brachycephalic European cast which has been available.

The significant feature, then, in the Australian cast and in the cast of the Bushman D. 709 is that the undue prominence of the cerebellum is present in association with dolichocephaly.

## DESCRIPTION OF FIGURES.

Figs. 1 to 6. Orthogonal projections of the dorsal, posterior, anterior, lateral, inferior and medial views of the skull. The skull was mounted in the Frankfort plane.

Fig. 7. A centimetre contoured map of the skull using the Frankfort plane as the base plane.

Pl. XV. Figs. 8 to 11. Photographs of the normae verticalis, occipitalis, frontalis and lateralis, respectively.

Pl. XVI. Figs. 12 to 14. Photographs of the normae basalis and lateralis and of the median section of the skull.

Pl. XVII. Fig. 15. X-ray photograph of the skull taken from the lateral aspect.

Pl. XVIII. Figs. 16 to 19. Photographs of the endocranial cast taken from the anterior, dorsal, posterior and lateral aspects.

C. coronal elevation, F. frontal depression, P. parietal depression, PCD. post-coronal depression,

PO. parieto-occipital depression, O. orbital elevation, T. post-temporal elevation.

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